TEMPO: Determining, Combining, and Predicting Earth Orientation Parameters for Spacecraft Navigation

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In support of spacecraft tracking and navigation at the Jet Propulsion Laboratory (JPL), Earth orientation measurements arc currently acquired, processed, and delivered twice-per-week to the JPL navigation teams by the Time and Earth Motion Precision observations (TEMPO) project. Because the Earth's orientation changes rapidly and unpredictably, measurements must be acquired frequently and processed rapidly in order to meet the near-real-time Earth orientation calibration requirements of the navigation teams. These requirements arc currently met by (1) conducting twice-per-week single baseline VLBI observing sessions; (2) rapidly processing the VI .BI data to determine the baseline variation-of-latitude and UT() components of the Earth's orientation; and (3) using the Kalman Earth Orientation Filter (KEOF) to combine the TEMPO VLBI measurements with other publicly available Earth orientation measurements, including determinations and forecasts of the axial component of the atmospheric angular momentum (AAM), in order to generate and deliver the Earth orientation calibrations (polar motion and I-J-I' I) required by [he navigation teams.

In the near future, the Global Positioning System (G} 'S) will be used to provide daily determinations of polar motion and length-of-day within 24 hours of acquisition. TEMPO VLBI observing sessions will still be conducted, although less frequently anti with the data processed icss rapidly, in order to provide the benchmark universal time measurements between which the GPS length-of-day measurements will be integrated. The KEOF will be used to combine the G1'S polar motion and length-of-day measurements with the TEMPO VLBI variation-of-latitude and UT0 measurements, along with other publicly available Earth orientation and AAM determinations, in order to generate and deliver the required pol ar motion and UT i calibrations to the JPL navig ation teams.